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A comparative analysis of the operations and performance of aviation cargo handling companies in Nigeria

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General Note

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ABSTRACT

The study examines the levels of inputs and output of the cargo handling services and determines the benchmark cargo handling firm in the industry. The research work majors on SAHCOL and NAHCo in Muritala Muhammed International Airport Lagos. The study employs the use of secondary data sources from SAHCOL and NAHCo. The data collected were analysed using Data Envelopment Analysis (DEA). The study shows that the inputs supplied by the firms are workforce, facilities and equipment while outputs are cargo throughput and revenue. The result indicated that, SAHCOL inputs 0.88 level of inputs and gets 0.88 level of output while NAHCo inputs 1.17 level of inputs and gets 1.07 level of output. Therefore, SAHCOL is the benchmark cargo handling

firm in the industry as it has a 100% level of efficiency while NAHCo has 92% level of efficiency. It thus recommends that a well-organized data bank should be stored by cargo handling companies for more research and decision making to be made.

Keywords: Aviation Cargo Handling, Benchmarking, Inputs and Outputs, Operations, Performance

1. INTRODUCTION

The air cargo industry plays a vital role in the world economy, as it is the major mode of transport for luxury goods and high-value products as well as consumables with low shelf-lives. Although it covers only 1 to 2 per cent of the global trade in respect to tonnage, this is about 35 per cent of the value of the world total trade (Boonekamp, 2014). As the world economy is recovering from the financial crisis and strong growth rates of international trade and world GDP are expected, the air cargo industry is expected to experience strong growth in the next decades (Boonekamp, 2014).

Today, world trade is more dependent on air cargo services than before. Several factors have led to this situation. First, firms aiming at reducing inventory costs and adopting just-in-time production theory have been using air cargo logistics as a medium to transport their products in the most reliable and fastest way. Second, where the life span of products is short, air cargo is the fastest way for the products to meet the customers' needs. Third, it's declining costs due to liberalization and technological advancement that now make air cargo logistics more reliable. And finally, as firms shift their production facilities abroad, where competitive advantage is created by labour costs, air cargo logistics is relied upon (Ozcan, 2013).

Air cargo demand is limited by cost, which is priced 4 to 5 times that of road transportation and 12 to 16 times that of water transportation. This is a direct benefit for its speed and efficiency advantages. As the volume of air cargo grows, there is a natural progression from passenger aircraft to chartered cargo plans of increasing size and ultimately to scheduled cargo services (Air Freight, 2009).

On a worldwide level, the transport of commercial cargo is a key economic indicator of international trade and a thermometer for the state of the global economy (Hao, 2013). The logic is simple: as people become more productive, they become richer. As they become richer, they demand more consumer goods. The supply chain and logistics industry exist to connect manufacturers with suppliers and middlemen shippers with the end consumer (Hao, 2013).

Air cargo handling operations is the provision of logistics to facilitate the transportation of cargo by air. It also entails putting in place the proper and necessary expertise with equipment to carry out the right task timely, safely, securely and in a cost-effective manner (Ajigbotosho, 2006). At airports, aviation cargo handling operations may be rendered by the airports themselves or third party handlers, as the case of Zagreb Airport (Drljaca, 2017).

Air cargo handling operation can also be provided in-house by airlines themselves. Airlines outsource their handling services as this can lead to reduced overheads due to the specialization and economies of scale enjoyed by third party handlers. In doing so, airlines can avoid or reduce the high fixed cost component of aviation handling including the purchase and maintenance of expensive equipment which would not have been used frequently enough to justify the expense.

In Nigeria, aviation cargo handling is rendered by third party handlers at the airports in the country with NAHCo and SAHCOL consistently in a competition for market share. In the country, airlines are not allowed to render self-handling by law, so they have to outsource to one of the two operational handlers in the country.

From the literature research, it has been revealed that out of the numerous work done on the air cargo transportation subsector not too much work has been carried out on aviation cargo handling in Nigeria. Some of the work done focusing on aviation cargo handling are; Analysis of the volume of air cargo traffic at the major international airports in Nigeria (Adenigbo & Ubogu, 2014), Privatization – A study of Nigeria Aviation Handling Company (NAHCo) PLC. (Ajiboye & Olowokere, 2009), Assessment of terminal capacity for cargo handling in Lagos Airport, Nigeria (Adenigbo, *et al*., 2019), Determinant of the development of Air cargo handling Operations in Lagos International Airport, Nigeria (Adenigbo, *et al*., 2016). From the few aforementioned works of literature, researchers are yet to work on the Comparative Analysis of the Operations and Performance of Aviation Cargo Handling Companies in Nigeria.

Unfortunately, Nigeria seems to be lagging in the air cargo business despite the dedication of an airport as an international air cargo airport – the Imo Airport in Owerri. There is an upsurge in the importation of foreign-made goods which is adversely affecting similar goods that are locally produced as the majority of air cargo airlines that land at Lagos airport with imported products leave almost empty. The challenges facing the air cargo business in the country, though not insurmountable, are enormous and maintained that it would take a sincerity of purpose to solve them.

The facilities provided by the handling companies at Lagos airport may seem to be sufficient to accommodate the current daily traffic of cargo in and out of Lagos airport according to Adenigbo, Okoko, & Gbadamosi (2019). This is so due to the trade imbalance or trade balance deficit experienced in Nigeria, where imported cargoes are higher than the exported cargoes. If Nigeria experiences a trade balance or surplus, the facilities available for exported cargoes will not be able to accommodate them.

Hence, the focus of this research is to comparatively analyze the aviation cargo handling companies in Nigeria in consideration of Skyway Aviation Handling Company Limited (SAHCOL) and Nigeria Aviation Handling Company PLC (NAHCo Aviance) to compare their operations and cargo handling performances and determine the benchmark cargo handling firm in the industry.

2. MATERIALS AND METHODS

This is a descriptive study; the research employed only the use of secondary data. The data was obtained from the records of SAHCOL and NAHCo Aviance in Muritala Muhammed International Airport Lagos.

Data Envelopment Analysis (DEA) was employed to determine the benchmark cargo handling firm in the industry. DEA is a new "data-oriented" approach for assessing the performance of a set of peer entities that is referred to as Decision Making Units (DMUs). which translate multiple inputs into multiple outputs. The definition of a DMU is flexible and generic. It is based on the Cobb Douglas Production Function. DEA can only be done when all the entities being assessed have common attributes, as these attributes will form the basis for comparison. Because very few assumptions are required, it is possible to use DEA in cases where there is resistant to other approaches due to complex or usually unknown nature of the relationship between the multiple inputs and outputs involved in the DMUs (Cooper, *et al*., 2011).

DEA has been used to provide new insights into entities that have been previously assessed by other methods. For example, studies carried out on benchmarking practices employing DEA have identified many sources of lapses in some of the most profitable firms and this has created an avenue for identifying better benchmarks in several applied studies (Cooper, *et al.*, 2000)

The following attributes were therefore collected for the DEA computation; handling capacity of the equipment, capacities of the facilities and workforce for inputs, while for output, cargo throughput and revenue. SAHCOL and NAHCo aviance were chosen to have the DMUs.

Steps to Generating DEA

Step 1: Develop a Linear Programming for DEA

a. The objective should be to maximize whatever input is set for the best possible output,
b. Pick the number of DMUs,
c. Select the number of inputs and outputs; inputs are variables, outputs are also variables- input 1 is the workforce in labour hour, input 2 is handling capacity in kilogram, input 3 is storage facilities in square metres, output 1 is the volume of cargo throughput in kilogram, output 2 is the revenue in billions of naira.
d. State the constraint number, in this case, it is three.

Step 2: State the lower bounds and upper bounds for the variables.

Step 3: i. Create the DEA data interface and put in the data.

ii. Build the DEA Linear Programming Model.

Step 4: Solve the DEA Linear Programming Model to generate goal

Step 5: Solve for efficiencies, using the DEA data interface to get the Focus DMU factor solutions and focus DMU efficiency solutions.

3. RESULTS AND DISCUSSION

Table 1 shows the difference between NAHCo and SAHCOL, in terms of the level of inputs and output of each company. The table shows the labour capacity of each company, SAHCOL is seen to have 543 (48.10%) number of labour compared to that of NAHCo who has 586 (51.90%) workers with NAHCo having 43 workers higher than SAHCOL. From the facility part, SAHCOL has a larger capacity of 22,510 (Square meters) while that of NAHCo is 21,676.02 (Square meters). NAHCo has a larger cargo handling capacity concerning equipment compared to SAHCOL, NAHCo has equipment that could handle 148,000Kgs of cargo per day (148 tons) while that of SAHCOL is 111,000Kgs (111 tons) of cargo per day.

Table 1. Level of Input and Output

Criteria	NAHCO	R	%	SAHCOL	%	R
Labour	586 workers	1ST	51.90	543 workers	48.10	2nd

Facilities	21,676.02m^2	2nd	49.06	22,510m^2	50.94	1st
Equipment	148,000Kgs	1st	57.14	111,000Kgs	42.86	2nd
Output	₦288,031,185.60 ₦2,711,618,922	1st	53.19	₦220,595,032 ₦2,418,979,995	46.81	2nd

Source: Survey Work, 2019

Table 2 shows the results of the performance of each of the handling companies which were then used to determine the relative performance of these handling companies against each other so that a benchmark handling company can be identified using Data Envelopment Analysis (DEA). DEA can only be done when all the entities involved or being assessed have common attributes, as these attributes will form the basis for comparison. The following attributes were therefore selected for the DEA computations: Labour hour, Storage Facilities and Equipment (cargo handling capacity) for inputs, while for output Cargo throughput and revenue for the handling companies were used to prepare the Linear Programming (LP) for the DEA for the performance analysis of the handling companies who were the DMUs. The goal of the LP was to maximize the objective which is efficiency.

Table 2. Data Envelopment Analysis

Name:	DEA_1_LP	Data	DEA_1_DEA	Solver:	Jensen LP/IP
Type:	LP1	Focus Index	2	Type:	Linear
Goal:	Max	Focus Name	DMU 2	Sens.:	No
Efficiency:	1			Side:	No

		Outputs		Inputs		
	Variables	1	2	3	4	5
	Name:	Output 1	Output 2	Input 1	Input 2	Input 3
	Weight:	1.276E-08	1.307E-10	0	6.757E-06	0
	Lower Bounds:	0	0	0	0	0
	Upper Bounds:	10000	10000	10000	10000	10000
	Linear Obj. Coef.:	47628118	3E+09	0	0	0

Rel.	RHS		Linear Constraint Coefficients				
=	1	2	0	0	7032	148000	21692
<=	0	1	31727820	2.64E+09	-5688	-111000	-22510
<=	0	2	47628118	3E+09	-7032	-148000	-21692

Table 3. Dea Performance Level

	DEA		Trial Weighted Factors		
Focus	Efficiency		Output	Input	Efficiency
DMU 1	100%	1	0.88	0.88	100%
DMU 2	100%	2	1.07	1.17	92%

From the Table 3, SAHCOL is said to get the same output as what was inputted, therefore it could be concluded that SAHCOL maximized their resources while NAHCo inputs more into the cargo handling business than SAHCOL but in turn gets less than what

they have imputed. Based on how they have been able to optimize their inputs for the best possible output, SAHCOL has made 100% optimal use of her inputs while NAHCo has made 92% optimal use of her inputs.

From Table 4, With regards to determining the benchmark cargo handling company in the industry, SAHCOL is 100% as good has itself while NAHCo is also 100% as good as itself. Considering the benchmark cargo handling company, NAHCo is 85.2% as good as SAHCOL.

Table 4. Dea Efficiency Solution

				Focus DMU Efficiency Solutions	
		DEA		1	2
	Focus	Efficiency		DMU 1	DMU 2
1	DMU 1	100%	1	1	0.852311
2	DMU 2	100%	2	1	1

Source: Survey Work, 2019.

DMU 1: SAHCOL
DMU 2: NAHCo

Table 3 shows the efficiency comparison between the two handling companies under study, from the table it could be seen that DMU 1 has 0.88 (88%) input level and output of 0.88 (88%) which means that the handling company maximized their input. The efficiency level of the company is 100% which means that their handled cargoes commensurate with what was injected into it while DMU 2 has 1.07 (107%) input level and output of 1.17 (117%) which means that the handling company maximized their input. The efficiency level of the company is 92% which means that their handled cargoes are less than the expected level.

4. CONCLUSION

With this insight, it shows that NAHCo has the largest returns in term of revenue since they have more input invested into the business, and NAHCo has the largest share of revenue with about 53.19% of their total revenue shared. With this, it could be seen that it is the number of capacity that is inputted into the business that matter and how well an organization can manage what they have to bring out the best and also beat their competitors. This we can see in the case of NAHCo as the company has the largest returns on the input they incurred. Efficiency and performance level of SAHCOL is 100% this means that they maximized their capacity compared to that of NAHCo which is 92% that is 8% below the performance level and there is every possibility that in the nearest future, SAHCOL may likely handle more cargoes than NAHCo.

Recommendations

- There should be a well-organized data bank stored by cargo handling companies for more research and decision making to be made.
- The government of Nigeria should see to it that the exportations of goods are ensured that is equal to importation so that our economy is balanced. There should be a trade balance between Nigeria and other parts of the world so that there will be no empty containers going back from the country.
- There should be adequate equipment and facilities to handle cargoes should there be trade balance or surplus in the country in the nearest future.

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Conflict of Interest

The authors declare no conflicts of interests any matter related to this paper.

Data and materials availability

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Peer-review

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